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मानक

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“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

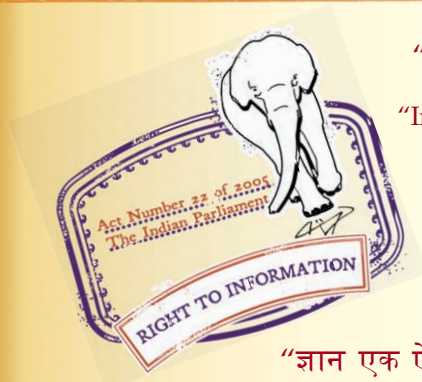
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 10872 (1984): Code of safety for malathion [CHD 8:
Occupational Safety, Health and Chemical Hazards]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 10872 - 1984

(Reaffirmed 2003)

Indian Standard

CODE OF SAFETY FOR MALATHION

UDC 614.878 : 632 : 951 MALATHION



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

CODE OF SAFETY FOR MALATHION

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Indian Standard

CODE OF SAFETY FOR MALATHION

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 April 1984, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

0.2 Malathion is an organophosphorus insecticide-acaricide used extensively in India and all over the world for control of a wide spectrum of insects and mites in agriculture, horticulture, veterinary, public health and household complex.

0.3 Malathion insecticide-acaricide is itself a poor inhibitor of the enzyme cholinesterase. However, on conversion into its oxygen analog, malaaxon, for example, by liver enzymes, it inactivates cholinesterase leading to accumulation of acetylcholine at synapses in the nervous system, skeletal and smooth muscles, and secretory glands. These are stimulated at low and depressed at high concentrations of malaaxon. However, due to rapid detoxification by aliesterases in the liver and other organs, malathion is of lower toxicity than most other pesticides and continues to be one of the safer pesticides known to man.

0.4 Indian Standard specifications are available for a number of malathion formulations, as follows.

0.4.1 *Liquid*

- a) Malathion technical or ultra-low-volume (ULV) concentrate (IS : 1832-1978),
- b) Malathion emulsifiable concentrate (IS : 2567-1978), and
- c) Household insecticide mixtures and hair lotions containing 1 to 5 percent malathion.

0.4.2 *Powder*

- a) Malathion water dispersible powder concentrates (IS : 2569-1978), and
- b) Malathion dusting powders (IS : 2568-1978).

0.4.3 Besides, an Indian Standard code for packaging of pesticides (IS : 8190*) in 3 parts is also available.

0.5 Malathion is an approved insecticide under the *Insecticides Act*, 1968 and relevant Rules under *Factories Act* apply in various States of India.

0.6 In the preparation of this code assistance has been derived from the following publications:

- a) PROCTOR (N H) and HUGHES (J P). Chemical hazards of the workplace. 1978. J.B. Lippincott Company, Philadelphia & Toronto, USA.
 - b) NAMBA (T), GREEN FIELD (M) and GROB (D). Malathion poisoning. *Archives of Environmental Health*; 1970; 21; 533.
 - c) Anonymous. Safe use of pesticides. 1979. World Health Organization Technical Report series, No. 634.
 - d) HAZELTON (L W) and HOLLAND (E C). *AMA Arch. Ind. Hyg. Occup. Med.* 1953; 8; 399-405.
 - e) GOLZ (H H). *AMA Arch. Ind. Health.* 19; 1959; 516-525.
-

1. SCOPE

1.1 This code describes properties of malathion, nature of hazards associated with it, medical information on symptoms and signs of poisoning; differential diagnosis; measures for first-aid and medical treatment; good safety practices in storage, handling transport and use; decantamination and disposal of containers and spillage; and requirements for safety education.

1.2 This code does not deal with specifications for design of building; engineering and safety equipment; methods and ingredients used in manufacture; or with application dosages and directions for use as a pesticide.

2. TERMINOLOGY

2.1 For the purpose of this code the definitions as given in IS : 4155-1966† and IS : 4167-1966‡ shall apply.

*IS : 8190 Specification for requirements for packing of pesticides:

Part 1 (1980) Solid pesticides (*first revision*).

Part 2 (1980) Liquid pesticides (*first revision*).

Part 3 (1979) Household pesticides.

†Glossary of terms relating to chemical and radiation hazards and hazardous chemicals.

‡Glossary of terms relating to air pollution (*first revision*).

3. GENERAL INFORMATION AND PROPERTIES OF MALATHION

3.1 General Information

- 3.1.1 Common Names** — Malathion, Maldison, Mercaptothion, Carbofos
- 3.1.2 Chemical Names** — S-1, 2-di (ethoxycarbonyl) ethyl 0-o dimethyl phosphorodithioate and dimethyl dithiophosphate of diethyl mercaptasuccinate
- 3.1.3 Empirical Formula** — $C_{10}H_{19}O_6P S_2$
- 3.1.4 Molecular Formula** — $C_{10}H_{19}O_6P S_2$
- 3.1.5 Molecular Weight** — 330.36

3.2 Physical Properties

- 3.2.1 Description (Colour, Odour Physical State)** — Colourless, yellow, amber or brown clear liquid. Technical grade has mercaptan-like odour
- 3.2.2 Melting Point** — 2.85°C
- 3.2.3 Boiling Point** — 156-157°C at 9.3 kPa (with slight decomposition)
- 3.2.4 Specific Gravity** — 1.23 minimum at 25°C
(Water at 25°C = 1)
- 3.2.5 Refractive Index** — 1.4985
- 3.2.6 Viscosity**
- at 25°C — 36.78 centipoise
(0.368 dyne/sec/cm²)
- at 40°C — 17.57 centipoise
(0.176 dyne/sec/cm²)
- 3.2.7 Vapour Pressure** — 5.33×10^{-3} Pa at 30°C
- 3.2.8 Heat of Freezing** — Not available
- 3.2.9 Heat of Vaporization** — Not available
- 3.2.10 Evaporation Rate** — Not available
- 3.2.11 Miscibility/Solubility in Common Solvents** — About 145 ppm in water at 25°C, completely miscible in most alcohols, esters, high aromatic solvents, ketones and vegetable oils; poorly miscible with aliphatic hydrocarbons

3.3 Chemical Properties

- 3.3.1** *Affinity for Other Chemicals* — Not applicable
- 3.3.2** *Important Common Reactions* — Malathion is rapidly hydrolyzed at pH above 7.0 or below 5.0, but it is stable in aqueous solutions buffered at pH 5.26. Malathion liquids may gel if stored in direct contact with iron or tin plate and therefore should be kept in container with internal protective coatings
- 3.3.3** *Stability at High Temperature* — Increasingly unstable with rise of temperature above 160°C
- 3.3.4** *Flammability* — Not flammable
- 3.3.5** *Supporter of Combustion* — No

3.4 Fire and Explosion Hazard Properties

- 3.4.1** *Flash Point* — Above 160°C (320°F)
(Tag Open Cup)
- 3.4.2** *Ignition Temperature* — Not applicable
- 3.4.3** *Spontaneous Heating or Combustion* — None
- 3.4.4** *Shock Sensitivity* — None

3.5 Corrosion Properties

- 3.5.1** *Conditions When Corrosive* — In presence of moisture
- 3.5.2** *Materials to Which Corrosive* — Unlacquered metals, for example, iron, tinplate

4. HEALTH EFFECTS AND TOXICITY INFORMATION

4.1 General

- 4.1.1** *Threshold Limit Value* — 10 mg/m³ in air
(ACGIH*)
- Short-Term Exposure Limit* — Not available

*As accepted by the American Conference of Government Industrial Hygienists, USA.

4.1.2 Concentrations Causing

- a) *Eye irritation* — Not available. Systemic eye effects may preclude local eye irritation
- b) *Respiratory irritation* — Not available. Systemic effects would set in before local irritation of respiratory organs occurs
- c) *Skin irritation* — May cause sensitization of skin at high concentration

4.1.3 Odour Threshold Concentration

— Not available

4.1.4 Concentration Immediately Dangerous to Life

- a) *Acute toxicity** — Moderate toxicity by ingestion, and low toxicity by dermal absorption or inhalation. Typical acute toxicity values for technical grade malathion are:

Oral LD₅₀ rat — 1 400 mg/kg body mass

Dermal LD₅₀ rat — Above 4 444 mg/kg body mass

Dermal LD₅₀ rabbit — 4 100 mg/kg body mass

Inhalation LD₅₀ rat — (1 h) — Above 60 000 mg/m³ or 4 440 ppm

- b) *Inhalation no-effect-level* — 64.8 mg/m³
(84 exposures in 42 consecutive days)
for man†

4.1.5 Exposure Concentration

- a) Malathion is not cumulative in body tissues
- b) Due to its effect on cholinesterase, continued exposure may ultimately reduce cholinesterase activity to hazardous levels

*Source: Havletan & Holland, 1953.

†Source: Golz, 1959.

- c) Evidence from long-term studies show that malathion is not carcinogenic, mutagenic, teratogenic and shows no delayed neurotoxicity in man and experimental animals

4.2 Routes of Entry

- a) Respiratory — Poorly absorbed by inhalation and through skin
- b) Skin — Not available

4.3 Signs and Symptoms of Poisoning, Diagnosis and Medical Treatment Advice

4.3.1 Initial symptoms may include such nonspecific features as malaise, anorexia (lack of appetite), frontal headache, anxiety, nausea and vomiting.

4.3.2 Progressive diagnostic symptoms, for example from inhalation or eye, exposure to very high concentrations, include the following: hypersalivation, sweating, rhinorrhea, tightness in chest, laryngeal spasm (wheezing), productive cough, and visual difficulties, that is, aching in and behind eyes, blurring of distant vision, lachrymation (tears). At this point, muscular fasciculations and tremors may occur.

4.3.3 In severe cases, for example, ingestion symptoms in **4.3.2** are accompanied by pinpoint and non-reactive pupils, abdominal cramps, diarrhoea, loss of reflexes and sphincter control, cyanosis, convulsions, prostration, and pulmonary edema (up to 12 hours after poisoning). Sudden unconsciousness or toxic psychosis resembling acute alcoholism, extreme bradycardia (slow heart-beat), cardiac arrhythmias and heart block may be observed. Respiratory depression can be caused by toxicant and also by hydrocarbon solvent.

4.3.4 Continuing absorption at intermediate doses may cause an influenza-like illness characterised by weakness, anorexia and malaise.

4.3.5 Miosis is typical in moderate to severe poisoning while hyperglycemia and glycosuria without acetonuria may be noted in severe cases.

4.3.6 Onset of symptoms may be after 5 minutes in case of ingestion or aspiration of large quantities, but is usually within 12 hours and always less than 24 hours typically being one or more hours after direct skin or eye contamination. The delay of symptoms is due to malathion, itself a poor cholinesterase inhibitor.

4.3.7 Differential Diagnosis — Diagnosis is based primarily on a history of exposure to malathion and on clinical evidence of diffuse parasympathetic stimulation. Distinguish from cerebral haemorrhage, heat exhaustion, hypoglycemic episode, and lung and alimentary diseases, for example, pneumonitis, gastro-enteritis.

Laboratory evidence of depression of plasma and/or RBC (red blood cell) cholinesterases to levels much below pre-exposure levels (at least 50 percent and usually much lower) is confirmation of organophosphorus poisoning, although on occasions this may be less pronounced than might be expected from the state of the patient. (Some individuals may have normally low plasma cholinesterase activity due to genetic reasons, that is, generation of typical enzyme from liver). If organophosphate poisoning is likely, do not delay treatment pending confirmation of diagnosis by blood analysis. Careful observation of effects of atropine and pralidoxime or obidoxime (toxogenin) may help diagnosis that is failure of parenterally administer 1-2 mg atropine to produce signs of atropinization (flushing, mydriasis, tachycardia, dryness of mouth) indicates organophosphorus poisoning. Injection of pralidoxime (1 g intravenous) or obidoxime (250 mg intramuscular) generally causes some recovery from signs and symptoms of poisoning.

4.3.8 Emergency Aid Measures — When symptoms of poisoning appear, decontaminate victim at once as follows:

- a) *If skin and body parts contaminated* — remove contaminated clothing and wash skin thoroughly with generous amounts of soap or detergent and water for at least 10 minutes, preferably under a shower or by submersion in a pond or other body of water if the exposure has occurred in the field. Careful attention must be paid to cleansing of skin and hair.
- b) *If inhaled in large amounts* — remove to open fresh air and if needed, give artificial respiration.
- c) *If eyes are contaminated* — irrigate conjunctiva with clean water for 10 minutes, keeping eyelids open.
- d) *If swallowed* — avoid mouth-to-mouth respiration. Give activated charcoal up to 50 g (5 to 10 tablespoon heapful) in 0.5 to 1.0 litre warm water (for children 1 to 2 tablespoon heapful in 1 to 2 cups of water). Inducing vomiting with common salt (2 to 4 tablespoon) in a glass of warm water can help to evacuate stomach quickly but should not be tried if victim is unconscious or if malathion emulsifiable concentrate (containing petroleum distillates) has been ingested, so as to avoid any chance aspiration into lungs.

Vomiting should be induced only when conscious victim is lying on his side with the head dependent. After vomiting, have the victim drink a suspension of 30 g activated charcoal in about 100 ml water to limit absorption of remaining toxicant in gut. Take victim to hospital at once in all cases of ingestion.

4.3.9 Medical Treatment of Acute Poisoning

4.3.9.1 Treatment in general ranges from simple removal from exposure in mild cases to the rapid and simultaneous application of antidotal and supportive measures in severe cases. Delay in treatment can be life-threatening.

If symptoms of poisoning appear; at once give atropine sulphate and pralidoxime chloride or obidoxime chloride as follows, whenever possible with supportive measures (*see 4.3.12*) being performed concurrently.

4.3.9.2 Atropine sulphate therapy

a) Mild to moderate poisoning

- 1) Dosage for adults and children above 12 years — 0.4 to 2.0 mg (1.0 to 5.0 ml of usual 0.4 mg/ml solution) by slow I. V. injection or intramuscularly if I. V. injection is not possible. This dose (2 mg) of atropine is about ten times the dose for other conditions in which atropine is considered therapeutic. The dose (2 mg) may be repeated, with or without oxime, at 5-10 minute intervals, depending upon response to first dose, until signs of atropinization appear; dry flushed skin, tachycardia (rapid pulse) as high as 140 beats/minute, drying of secretions, that is, fall in salivation or dryness of mouth. Maintain a mild degree of atropinization for about 12-24 hours, or even up to 48 hours in severe cases, to avoid relapse.
- 2) Dose for children under 12 years — 0.05 mg/kg body weight, that is 0.125 ml/kg body weight of usual 0.4 mg/ml solution, repeat every 15-30 minutes until atropinization is achieved. Maintain atropinization further with repeated doses of 0.02-0.05 mg/kg body weight.

Atropine protects the end-organs from high concentrations of acetylcholine. It does not reactivate cholinesterase, hence patient should be watched closely for the effects of unmetabolized toxicant may reappear as atropinization wears off. Less atropine may be needed after administration of oxime, for example pralidoxime or obidoxime.

- b) *In severe cases* — Persons with respiratory difficulties, convulsions and unconsciousness should be given 4-6 mg (proportionally lower for children) atropine sulphate I. V. initially, followed by repeated doses of 2 mg or as much as is needed to maintain full atropinization for at least 2-3 days. This should be done, whenever possible, concurrent with supportive measures for ensuring open airway and continued respiration (see 4.3.12.2). Atropine may cause ventricular fibrillations in cyanotic patients, and should be given only after satisfactory oxygenation/respiration is achieved. Patient's condition, including respiration, convulsions, blood pressure, pulse frequency and salivation should be carefully observed as a guide to further administration of atropine. Initially atropine may have to be given at intervals of 5 to 10 minutes. Every 2 mg dose should give a short-lasting improvement of respiration and reduction in cyanosis and convulsions. There may also be a shortlasting decrease of miosis. Tachycardia may occur and a careful watch must be kept on salivary secretion to prevent over-atropinization (signs for which are muscle twitching, fever, delirium). Usually, it may not be necessary to exceed 50 mg atropine per day.

4.3.9.3 Oxime therapy — Oximes are specific reactivators of inhibited cholinesterase and these should be used in cases of severe poisoning by organophosphate pesticides in which muscle weakness and twitchings persist despite atropine therapy:

- a) Following atropinization slowly inject 1 g pralidoxime as a 5 percent solution (1 g in 20 ml sterile water) at no more than 0.5 g/minute, preferably over 5 minutes. Repeat dose hourly, if muscle weakness is not relieved.

In very severe cases, this dose may be doubled. Slow administration may be achieved by giving pralidoxime in 250 ml normal saline by continuous intravenous drip over a 30-60 minute interval, for example, at the rate of 0.5 g/hour for adults and proportionally lower for children taking care not to overload patient with fluid. If intravenous injection is possible, pralidoxime may be given by deep intramuscular injection.

For pharmaceutical reasons, combination of atropine and pralidoxime is impracticable, hence the latter must be given at once after the former. After injecting pralidoxime, the effects of atropine may become more evident and a reduction in dosage schedule of the latter may be needed. Pralidoxime treatment is most effective within 24 hours of poisoning.

- b) Obidoxime chloride (Toxogonin) may be used instead of pralidoxime. Dosage - 250 mg slow I.V. or better intramuscular injection for adults and proportionally lower for children. Obidoxime has the advantage that it can be injected along with atropine intramuscularly especially in severe cases where patient needs treatment before full medical attention is available.

4.3.10 DO NOT GIVE MORPHINE, AMINOPHYLLINE, PHENOTHIAZINE, TRANQUILIZERS OR RESERPINE. Give adrenergic amines only if there is a specific indication.

4.3.11 If intractable convulsions (unresponsive to antidotes) occur in cases of severe poisoning, causes unrelated to organo-phosphate action may be responsible, such as head trauma, cerebral anoxia, and mixed poisoning.

Although not thoroughly tested in these circumstances, diazepam (Valium, Calmpose) (5-10 mg for adults, 0.1 to 0.2 mg/kg for children under 6 years or 23 kg body weight) is probably the safest and most reliable anticonvulsant. **CAUTION:** Be prepared to assist pulmonary ventilation mechanically, if respiration is depressed, and to counteract hypotensive reactions.

4.3.12 Supportive Measures

4.3.12.1 Whenever possible, following measures should be performed concurrently with atropine and oxime therapy, especially in severe cases.

4.3.12.2 It is essential to ensure that patient maintains a clear open airway and continued respiration as follows:

If patient is cyanotic, put him in a prone position with head down and to the left, mandible extended and tongue pulled forward. Clear mouth and pharynx of secretions with a cloth and by aspiration. If airway obstruction persists, use an oropharyngeal or nasopharyngeal airway or endotracheal tube, with aspiration at secretions. If needed, maintain respiration with oxygen and mechanical means, for example intermittent positive-pressure breathing apparatus.

4.3.12.3 If ingested in quantity sufficient to cause poisoning promptly evacuate stomach as follows:

- a) If patient is conscious and alert, and respiration is not depressed, induce vomiting by tickling throat with a blunt spoon or finger or by giving 2-4 tablespoon heapful common salt in a glass of water.
- b) If petroleum solvent has been ingested, there is risk of aspiration into lungs during vomiting, which could lead to chemical pneumonitis, hence vomiting in such cases should be induced only when the conscious patient is lying on his side with head dependent.

c) In hospital, evacuation of stomach can be done by intubation aspiration and lavage followed by catharsis as follows:

- 1) if patient is unconscious, respiration is depressed, and cough and gag reflexes are poor, insert a cuffed endotracheal tube prior to gastric intubation, to protect the lungs and maintain patent airway.
- 2) keep patient's head below level of stomach during intubation and lavage (that is, in Trendelenburg position or left lateral decubitus with head of table dipped downward).
- 3) in conscious patients and even unconscious patients with intact cough and gag reflexes, a large bore stomach tube (16 mm outside diameter) may be passed into the esophagus to a distance of 50 cm in adults.
- 4) promptly aspirate pharynx as regularly as possible to remove contents if gagging or vomiting occurs during intubation.
- 5) when gastric tube is in place, aspirate thoroughly before lavaging stomach with 300 ml (or less) isotonic saline or 5 percent sodium bicarbonate warmed to body temperature. Repeat till returning fluid clear. Before removing gastric tube, instil a slurry of 30 g activated charcoal in 100 ml of water to limit absorption of any remaining toxicant.
- 6) if bowel movement has not occurred within four hours of ingestion, give sodium sulphate in water by ingestion (if patient conscious) and by gastric tube (if patient unconscious) to speed elimination of toxicant.

Dosage — i) adults (12 years and older): 15 g in about 200 ml of water;

ii) children under 12 years: 0.2 g/kg body weight in 50-100 ml of water.

- d) Isotonic salt or balanced electrolyte solution may be given intravenously very cautiously to correct dehydration and electrolyte imbalance. In any case, avoid large amounts of intravenous fluids.
- e) Continuous and intensive observation of serious patients for at least 24 hours after initial improvement is essential since serious and sometimes fatal relapses (sometimes pulmonary edema) may occur due to continuing absorption of the toxin or dissipation of the effects of the antidotes. It is essential to decontaminate patient thoroughly before or during antidotal measures (*see* Emergency aid measures 4.3.8).

- f) In severe cases, it may be necessary to treat for respiratory acidosis, pulmonary infections or pulmonary edema.
- g) Taking blood samples for plasma and red cell cholinesterase determinations before and during treatment, can help to monitor recovery of patient.

5. STORAGE, HANDLING AND TRANSPORT

5.1 Storage

5.1.1 Always store malathion in closed and clearly labelled lacquered metal drums or other suitable vessels, away from moisture and heat.

5.1.2 The rooms or premises meant for storing malathion should be well-built, dry, well-lit and ventilated and of sufficient dimension.

5.1.3 Flooring should be acid proof such that any leaks or spills do not damage flooring.

5.1.4 It is desirable to have fire-proof electric fittings in the storage areas.

5.1.5 Fire protection measures should be taken in storage areas.

5.2 Handling and Transport

5.2.1 *Usual Method or Procedure for Handling and Transport of Chemical from Storage/Containers:*

- a) When opening containers, transferring material, or while mixing, avoid contact with mouth, skin and eyes. If necessary, especially when handling dusts, a facial visor and gloves should be worn.
- b) Mixing, if not mechanical, should always be carried out with a paddle of suitable length. Splashes should be washed at once from the skin or eyes with large quantities of water.
- c) All operators should be provided with soap and washing facilities to ensure strict personal hygiene at the end of each working day. If contaminated, clothing should be washed at the end of the working day. Before eating, drinking or smoking, hands and other exposed skin should be washed with soap or detergent and water.
- d) Mixers and baggers should wear rubber boots, gloves, aprons and masks. Spraymen should be provided with canvas shoes or boots, overalls, and caps with downturned brims.

5.2.2 Decontamination and Disposal of Containers and Spillage

- a) *Containers* — Residual malathion preparations in containers should be emptied in a diluted form into a deep pit taking care to avoid ground waters. The empty container may be decontaminated by

rinsing two or three times with water and scrubbing the sides. An additional rinse should be carried out with 5 percent sodium hydroxide solution which should remain in the container overnight. Impermeable gauntlets (elbow-length gloves) should be worn during this work and a soakage pit should be provided for the rinsings. Decontaminated containers should not be used for storing food and drink.

- b) *Spillage* — Malathion should be removed by washing with 5 percent sodium hydroxide solution and then rinsing with large quantities of water.
- c) *Incineration* — Decontamination of containers and residual malathion may be achieved by incineration above 700°C followed by absorption of resulting gases in aqueous or alkaline scrubbers or washing towers.

5.3 Transport

5.3.1 For inplant, mechanized loading and unloading of containers helps to minimize chance exposure of operators to malathion.

5.3.2 Always store malathion in dry, leadproof containers as laid down in IS : 8190 (Parts 1 and 2)-1976*.

6. FIRE PREVENTION AND FIRE FIGHTING

6.1 Dry chemical powder and carbon dioxide have been found to be the best for fire fighting.

6.2 It is advisable not to use water for fire fighting.

7. SPILLAGE AND LEAKAGE OF MATERIAL

7.1 In case of leaks or spills, fire or explosion danger are not there but on exposure, danger of toxic vapour is there.

7.2 Spraying of soda ash and flushing with water should be done for decontamination.

7.3 Ventilation, quick washing and drainage are advisable.

7.4 Persons engaged in above work should not inhale vapours. They should avoid direct contact.

*Requirements for packing of pesticides: Part 1 Solid pesticides: and Part 2 Liquid pesticides.

8. WASTE DISPOSAL

8.1 The waste materials obtained and the corresponding instructions for disposal are summarized below:

<i>Waste Material</i>	<i>Disposal Instructions</i>
a) No solid waste obtained	—
b) Washings of intermediates of malathion are alkaline in nature and are the only liquid waste	Washings should be neutralized
c) Hydrogen sulphide (H_2S) is produced as gaseous waste	Hydrogen sulphide should not be absorbed in caustic lye

9. FIRE PREVENTION

9.1 Provision of flame proof electrical equipment may be made in accordance with IS : 2148-1981*.

9.2 Open flames should be strictly prohibited inside the plant. Other ignition sources should be controlled to the maximum extent possible.

9.3 Earthing of individual equipment may be done in accordance with IS : 3043-1966†.

10. HAZARD INFORMATION

10.1 Malathion is classified as an insecticide. The word ' DANGER ' should be mentioned on the label of container, and the ' skull and bones ' symbol indicating to ' keep off ', should be put up at strategic locations in plant areas.

10.2 The following notices should also be displayed in the plant:

- ' Do not breathe vapour '
- ' Wash thoroughly after handling '
- ' Avoid direct contact '.

10.3 The following information should be given on the label:

Composition,
Precautions,
Antidotes, and
Hazard symbols.

*Flameproof enclosures of electrical apparatus (*second revision*).

†Code of practice for earthing.

11. PERSONAL PROTECTIVE EQUIPMENT

11.1 Fresh air supply masks should be provided inside the manufacturing plant wherever raw materials feeding systems are there.

11.2 The following non-respiratory, protective devices are recommended for use:

- a) chemical safety goggles, cup-type rubber framed or plastic goggles with impact resistant glass;
- b) plastic face shields of full length with forehead protection;
- c) safety shoes, hat, gloves made of rubber may be used to guard against liquid leaks or splashes; and
- d) full body overalls may also be worn and all contaminated clothing should be removed promptly and laundered and thoroughly dried before use.

12. TRAINING AND EDUCATION

12.1 Employees handling malathion shall be provided with information on the properties of malathion before they handle, through well planned training programme.

12.2 Preplacement training in emergency procedures shall include fire fighting, how to deal with spills, disposal procedures and first aid.

12.3 Periodical refresher training shall be imparted to the staff members who handle malathion on the various aspects.

13. HEALTH MONITORING

13.1 Diagnostic studies of persons for pre-employment should include electrocardiogram, sputum gram, stain and culture, differential white blood cell count, and arterial blood gas analysis.

13.2 The medical examination should take place every year.

13.3 Proper records should be kept of medical examinations.

14. FIRST AID

14.1 Action in Emergency

14.1.1 Poisoning

- a) Loosen tight clothing and remove obstructions, if any.
- b) Take off the contaminated clothing immediately.
- c) Apply artificial respiration immediately if breathing is stopped or irregular.

- d) If swallowed, do not induce vomiting when patient is unconscious or is in convulsions. If the patient can swallow, give milk, water or milk of magnesia.

14.1.2 Inhalation

- a) Move the patient to fresh air immediately, and
- b) Carry out steps in **14.1.1** (a) to (d).

14.2 Splash on Face or Eyes

- a) Holding eye lids open immediately wash the eyes and face thoroughly in the eye fountains or in a stream of running water.
- b) Arrange for the immediate medical attention.
- c) *Never use eye drops or other chemicals, as they may increase the extent of injury.*

14.3 Information to be Provided to Physician Rendering Medical Aid

14.3.1 Send the patient with case history or full details of accident including the name of the chemical which caused the injury or sickness.

14.3.2 Include the suggested treatment if proper antidote, etc, could be specified confidently. Otherwise leave it to the physician.

(Continued from page 2)

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	$1 \text{ N} = 1 \text{ kg.m/s}^2$
Energy	joule	J	$1 \text{ J} = 1 \text{ N.m}$
Power	watt	W	$1 \text{ W} = 1 \text{ J/s}$
Flux	weber	Wb	$1 \text{ Wb} = 1 \text{ V.s}$
Flux density	tesla	T	$1 \text{ T} = 1 \text{ Wb/m}^2$
Frequency	hertz	Hz	$1 \text{ Hz} = 1 \text{ c/s (s}^{-1}\text{)}$
Electric conductance	siemens	S	$1 \text{ S} = 1 \text{ A/V}$
Electromotive force	volt	V	$1 \text{ V} = 1 \text{ W/A}$
Pressure, stress	pascal	Pa	$1 \text{ Pa} = 1 \text{ N/m}^2$